

Foreword

“Despite the dotcom boom and bust, the computer and telecommunications revolution has barely begun. Over the next few decades, the Internet and related technologies really will profoundly transform society.”¹

By 2050 the Internet will have impacted our business, culture, and society as a whole as much if not more than did Gutenberg’s printing press 600 years ago in 1450. Sheer economics will force the majority of business and government interactions to be automated. Although the rate and extent of automation will vary by domain, most interactions will not only take place over the Web, they will be almost entirely free of human interaction. As with previous industrial revolutions, the profound impacts are unpredictable, especially the social, political, and religious impacts. However, the automation of everyday personal, commercial, and governmental activities is more easily predicted due to the potential economic benefits and the extrapolation of existing automation. The Third Industrial Revolution, the Information/Biotech Revolution, is well underway.

Typically, there are multiple alternative technologies on which next-generation technologies might be built. Currently there are only two widely accepted enabling technologies that are both new, and hence are in their infancy, and mission critical. They are Web Services and the Web, or the next-generation Web, called the Semantic Web. To achieve even some of the promises for these technologies, we must develop vastly improved solutions for addressing the Grand Challenge of Information Technology, namely dealing better with semantics or real-world “meaning”. More precisely, we must enhance automated actions and data to more closely correspond to the real-world actions and facts that they represent, with minimal human involvement. This Grand Challenge is the core challenge not just of Information Technology but also of all next-generation automated applications. This challenge has been calling out for a Silver Bullet since the beginning of modern programming.

¹ David Manasian: Digital Dilemmas: A survey of the Internet, *The Economist*, January 25, 2003.

So what is a Silver Bullet? The ancient Greeks believed in the mystical power of silver as an infallible defense, means of attack, or solution to an otherwise insoluble problem. Germanic folklore of the Middle Ages held that only silver could slay man-eating werewolves. In a popular late-nineteenth-century English novel a silver bullet was the only means of killing the werewolf that plagued London. In a myth from my youth, the Lone Ranger TV series, based on 1930–40s novels, starred the Lone Ranger, a masked, clean, and heroic vigilante who came to the defense of many a prairie town by using a single silver bullet to slay the villain. The term Silver Bullet entered into the computing vernacular in 1987² when “Silver Bullet” was used pejoratively to dismiss the potential of a simple or single solution to longstanding and otherwise invincible software engineering challenges.

“Ontologies: A Silver Bullet for Knowledge Management and Electronic Commerce” provides a comprehensive introduction to the only known potential Silver Bullet for the Grand Challenge. That Silver Bullet is ontologies. An ontology, in the sense used in this book, is a community-mediated and accepted description of the kinds of entities that are in a domain of discourse and how they are related. They provide meaning, organization, taxonomy, agreement, common understanding, vocabulary, and a connection to the “real world”. For a given community, dealing with an agreed-upon domain (e.g., selling software over the Web), the ontological solution provides a definition of all required concepts and their relationships so that every program, Web service, or database that solves a problem in that domain can automatically communicate with other like entities based on the common definitions. Such solutions require concepts, languages, and tools, many still in their infancy. This volume gives a comprehensive introduction to ontologies in the context of the Semantic Web and Web Services challenges that lie at the heart of the Next Generation of computing. It describes and illustrates the basic concepts, languages, and tools currently available and in development. It illustrates these with knowledge management and electronic-commerce applications. One application, selling software over the Web, is based on UN/SPSC, an ontology that is accepted and used worldwide. Hence, the applications in this volume are not just speculative. They solve real problems. What is speculative is the adoption and development of ontological concepts, languages, and tools to extend such solutions to all domains. Unlike most technological solutions, ontologies start with human, community agreement on an ontology. Hence, ontologies are not solely a technical challenge. This is what you should expect of a technical solution that connects to the real world as ontologies do, by definition.

² Frederick P. Brooks: “No Silver Bullet – Essence and Accidents of Software Engineering”, *IEEE Computer*, 20(4):10–19, April 1987.

It remains to be seen whether ontologies will be the Silver Bullet for Knowledge Management and Electronic Commerce as this volume suggests or whether ontologies will be just another failed claim for a next-generation technology. To become versed in this, the Grand Challenge of Information Technology, and to understand the challenges and potential solutions that ontologies, and currently only ontologies, offer, you must understand the material offered comprehensively in this volume. The Third Industrial Revolution has begun and ontologies offer the hope of a Silver Bullet to overcome the Grand Challenge that stands in the way of its realization.

White Stallion Ranch Communications
Tucson, AZ, USA
February, 2003

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